Structural resilience and resistance of a diesel-degrading bacterial consortium

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Little is known about the ability of microbial communities to maintain structural integrity in response to perturbations, such as carbon source change. This ability, usually called as structural robustness, can be characterized by investigating (i) the resistance of the community structure during perturbation, and (ii) the resilience of the structure after removing of the perturbation. The changes in the structure of the microbial community could be verified with the use of real-time PCR and the ddCt method for relative quantification, where relative quantities of particular taxa are determined. The aim of this study was to determine the structural resistance and resilience of bacterial community during change of carbon source (from diesel fuel to single model fuel constituents, and then back to diesel fuel). The employed community contained seven identified bacterial taxa.

First, the community was cultivated on commercially available diesel fuel. Next, community's biomass was divided and cultivated on: (i) alkanes; (ii) cycloalkanes, (iii) aromatic hydrocarbons; and (iv) biodiesel. After 5-week repetitive passages, the community samples were transferred back to initial carbon source – diesel fuel – and cultivated for the next 3 weeks.

The studied bacterial community was robust against changes in available carbon source and maintained its structural integrity. After passages on single fuel constituents, the logarithms of relative quantities of taxa decreased or increased up

to 4 orders of magnitude. This indicates low structural resistance of the studied community during the 5-week perturbation. After returning passages on diesel fuel, the relative quantities of bacterial taxa returned to the initial state (relative quantities of taxa were almost equal to zero point). This observation indicates that the studied community was structurally resilient and was able to recover its structure after removing of the perturbation.

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